

United States
Department of
Agriculture

Forest
Service

Forest Pest
Management

2500 S. Pine Knoll Dr.
Flagstaff, AZ 86001

Reply to: 3400

Date: July 27, 1993

Subject: Functional Assistance Trip to the Safford Ranger District.

To: Forest Supervisor, Coronado National Forest

On July 7 and 8, 1993 I met with Rich Kvale, Randall Smith, Larry Allen, Dick Streeper, and Dick Bassett to discuss the problem created by snow and ice damage in the spruce-fir forest type on Mt. Graham. The sites visited included Heliograph Peak, Webb Peak, the Columbine summer home site, and the astrophysical site. The main concern from my view is that insect or disease problems may arise from the downed material and the live standing/broken trees. Some of the insects that will utilize this material include spruce beetle (Dendroctonus rufipennis), Douglas-fir beetle (Dendroctonus pseudotsugae), and Ips spp.

The astrophysical site had small amounts of breakage and the material on the ground was generally small in size (3 inches or less). This material probably won't provide good breeding sites for the insects we are concerned about. The material examined showed no signs of attack.

The size of material at Webb Peak varied. There is material at this site greater than 8 inches in diameter. These larger broken trees have potential to be utilized by spruce beetle for brood production. Upon inspection, no spruce beetle galleries were found. Ips spp. and Scolytus piceae (spruce engraver) had attacked some of the downed material. The spruce engraver is not generally considered a pest and utilizes the small broken material (4 inches or less).

The Columbine summer home site had material similar in size to that at Webb Peak but in a more concentrated area. Ips engraver beetles were present in the downed trees. No spruce beetle galleries were detected.

Heliograph Peak had the most severe damage of all the sites. In general, the broken material, on the ground or standing, is large (14+ inches). Some of the material is currently being attacked by Ips spp. One spruce beetle gallery was found.

The large numbers of broken trees in these areas have the potential to provide breeding material for spruce beetles. At the time of these observations, only one spruce beetle gallery was detected. Spruce beetles may continue to fly until October, searching for good breeding sites. The material currently available on the ground can provide enough breeding sites for an outbreak of spruce beetle to develop. On a more positive note, the spruce beetle has a two year life cycle and there is some time to remove the broken material before or after it has become infested.


The most numerous attacks were caused by Ips engraver beetles. These beetles generally do not attack live standing spruce trees. The utilization of the downed material by these beetles may also be beneficial. If the engraver beetles use up all of the prime breeding material, then there is less space for the spruce beetles to lay eggs and for their larvae to develop.

No Douglas-fir beetles were detected at any of the sites. They generally utilize downed material for breeding and there appeared to be little Douglas-fir in the broken/damaged category. At this point, it does not appear that this insect will be a problem.

Recommendations

It would be advisable to remove as much of the broken spruce material as possible, especially in stands where there is a residual spruce component. The broken material can be left on the ground to serve as "trap" trees and then be removed once infested (see enclosed Technical Information). This can reduce the number of available breeding sites for spruce beetle populations to build and/or remove any beetle brood that is developing. An outbreak of spruce beetle or Douglas-fir beetle may set succession back to the primary or secondary stages by partially or completely destroying forest structure.

A survey is being planned for the week of August 16, 1993. This information should provide a better picture of beetle population densities. In addition, stand examinations will be needed to help identify stands at high risk of spruce beetle or Douglas-fir beetle attack. Funding is available from FPM for risk rating of stands. If you have any questions, I can be reached at (602) 556-2072.


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Enclosure

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Technical Information

Spruce Beetle

Spruce beetle is normally present in small numbers in weakened or windthrown trees, large pieces of slash, and fresh stumps. This bark beetle has a 2 year life cycle. Attacks begin in May and can last until October. The needles of infested trees usually turn yellowish green and fall about one year after the attack. Pitch tubes or boring dust may be seen at the entrance holes. The egg galleries formed by the spruce beetle underneath the bark run parallel to wood grain, average 5 inches in length, and are packed with frass. Larvae mine outward from the egg gallery, initially feeding as a group and later constructing individual feeding galleries. The larvae overwinter and pupate the following summer (1 year after attack) in chambers at the end of larval galleries. Adult beetles may overwinter in the pupal sites or in the bases of infested trees. The following spring (2 years after attack), the adults emerge and attack new host material.

Sporadic outbreaks have killed extensive stands of spruce. Such outbreaks commonly develop in windthrown trees or logging residuals. During epidemics, large, old trees are usually killed first. Trees of all ages and diameters, except seedlings and saplings, may be attacked if an infestation persists in an area. Highest risk stands for spruce beetle are "located on well-drained sites in creek bottoms, have an average diameter of live spruce more than 16 inches dbh, have a basal area of over 150 ft², and a proportion of more than 65% spruce in the canopy" (Schmid, J.M. and R.H. Frye. 1977. Spruce beetle in the Rockies. USDA For. Serv. Gen. Tech. Rep. RM-49, 38p.) Spruce beetle epidemics modify stand structure: "they reduce the average age of the surviving trees, lower the average diameter and height of the stand and the spruce component, lower the density, and leave suppressed and intermediate trees as the dominant or codominant spruce" (op. cit.). For example, in a recent spruce beetle outbreak in the White Mountains of Arizona, average stand diameter dropped from approximately 25 inches dbh to 15 inches. Prevention of spruce beetle outbreaks should include: identifying high risk stands, early detection of population increases, and prompt removal or treatment of downed spruce trees. Outbreaks of spruce beetle can be controlled by felling trap trees. Large green trees are felled to attract beetles. The trees are then removed or burned prior to beetle emergence.

Douglas-fir beetle

The Douglas-fir beetle (DFB) is found throughout the range of Douglas-fir in the western US. Infestations usually occur in trees damaged by windfall, fire scorch, defoliation, drought or disease. Mortality is greatest in dense stands of mature Douglas-fir. Typical attacked stands contain a majority of Douglas-fir and are stocked at 80 to 124 percent of normal. Average age of attacked trees exceeds 120 years, however younger trees can be attacked.

External evidence of infestation consists of reddish-orange frass expelled from entrance tunnels and clear resin exuding from entrance holes on the stem at the upper limit of the infestation. Several months after a tree is infested the foliage becomes discolored. Under the bark, adult beetles construct egg

galleries in the inner bark. Galleries run parallel to the grain of the wood and average 5-12 inches long. Larvae feed in larval mines which run perpendicular to the adult galleries. Attacks of the DFB are usually most abundant at mid bole. Attacks may extend up the bole to a point about 8-10 inches in diameter. The lower bole on large trees may either escape attack entirely the first year or be unsuccessfully attacked. When this occurs the base may be attacked the following year.

DFB produces one generation per year. Brood overwinters as larvae and adult beetles. Overwintering adults emerge and disperse from April to early June, while overwintering larvae emerge from July through August.

Prevention of Douglas-fir beetle epidemics can be accomplished by removing all logs within 1 year of felling date, minimizing culls and slash larger than 8 inches in diameter, avoiding mechanical damage to trees. The only practical direct control of outbreaks is through prompt salvage of beetle-killed, wind-thrown, or fire killed trees before the beetles emerge.

Ips Engraver Beetle

Species of Ips which are capable of attacking spruce include Ips bonanseai (Hopkins), I. pini (Say), I. hunteri Swaine, and I. pilifrons Swaine. Ips engraver beetle attacks are initiated by adult males. The attack process is mediated by pheromones released by the beetles in combination with host terpenes. The male is joined by one to many females. After mating each female constructs an egg gallery in the inner bark, slightly scoring the wood surface. Egg galleries are not packed with boring dust, this distinguishes them from the Dendroctonus spp., such as the western pine beetle. Eggs are laid on each side of the gallery. Larvae feed in mines that run laterally from the egg gallery. The larval mines are packed with frass. Pupation occurs in an oval cell chewed by the larva.

External evidence of attack consists of accumulations of reddish brown boring dust in bark crevices and at the base of the tree, small entrance holes, and occasionally pitch tubes on living trees. When the bark is removed from infested trees, the galleries can be seen in the inner bark or on the surface of the sapwood.

These insects prefer to attack freshly cut slash, windthrow and snow broken material. Standing green trees may also be attacked, but often only the tops are killed on large trees. The minimum diameter of attack is around 4 inches.